

was close to our predicted rate. We documented 34 primary outcome events and 117 total events incl IBR, 'all recurrences' (which included IBR, loco-regional and/or distant recurrence, and deaths). The numbers of events, percentages and confidence intervals were as follows, in each case for TARGIT vs EBRT. IBR events 23 vs 11 (3.3% vs 1.3%, HR 2.07, CI 1.01 - 4.25); 'All recurrences' 69 vs 48 (8.2% vs 5.7%, HR 1.44, CI 0.99-2.08); Deaths 37 vs 51 (3.9% vs 5.3%, HR 0.7, CI 0.46-1.07). Thus the IBR event rate was 2.0% higher with TARGIT-IORT but was within our pre-set non-inferiority margin. In the pre-pathology group (approx two-thirds of all pts in study) the IBR rate was 1.0%, and in post-pathology 3.7%. For the secondary outcome there was a non-significant trend towards improved overall survival for the TARGIT group (HR 0.7, CI 0.46-1.07), due to fewer non-breast cancer deaths (17 vs 35 events, HR 0.47, CI 0.26-0.84). Cardiovascular deaths were 2 vs 11 and deaths from other cancers were 7 vs 16. Further analyses will be presented at the meeting.

Conclusions: The risk-adapted approach using TARGIT-IORT resulted in a slightly higher IBR rate, though still at present within our pre-set 'non-inferiority' margin. The pre-pathology group, i.e where the IORT was applied immediately after removal of the tumour, had a better outcome. The overall death rate was lower in the TARGIT group, due to a lower rate of non-breast cancer death.

SYMPOSIUM: RESEARCH CHALLENGE FROM HORIZON 2020

SP-0237

Research challenge from Horizon 2020: Clinical perspective

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Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe2020 flagship initiative aimed at securing Europe's global competitiveness. Running from 2014 to 2020 with an €80 billion budget, the EU's new programme for research and innovation is part of the drive to create new growth and jobs in Europe.

Compared to the previous tools, Horizon 2020 provides a single set of rules, combining all research and innovation funding currently provided through the 7FP, the innovation related activities of the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT).

Simplification in Horizon 2020 (compared to actual 7FP) will target three overarching goals: to reduce the administrative costs of the participants; to accelerate all processes of proposal and grant management and to decrease the financial error rate.

Main three priorities

Horizon 2020 will focus resources on three distinct, yet mutually reinforcing, priorities:

- Excellent Science

This will raise the level of excellence in Europe's science base and ensure a steady stream of world-class research to secure Europe's long-term competitiveness. It will support the best ideas, develop talent within Europe, provide researchers with access to priority research infrastructure, and make Europe an attractive location for the world's best researchers.

This will:

- support the most talented and creative individuals and their teams to carry out frontier research of the highest quality by building on the success of the *European Research Council*;
- fund collaborative research to open up new and promising fields of research and innovation through support for *Future and Emerging Technologies* (FET);
- provide researchers with excellent training and career development opportunities through the *Marie Skłodowska-Curie actions*¹⁵ (*Marie Curie actions*);
- ensure Europe has world-class *research infrastructures* (including e-infrastructures) accessible to all researchers in Europe and beyond.

- Industrial Leadership

This will:

- build *leadership in enabling and industrial technologies*, with dedicated support for ICT, nanotechnologies, advanced materials, biotechnology, advanced manufacturing and processing, and space, while also providing support for cross-cutting actions to capture the accumulated benefits from combining several Key Enabling Technologies;
- facilitate *access to risk finance*;
- provide Union wide support for *innovation in SMEs*.

- Societal Challenges

This reflects the policy priorities of the Europe 2020 strategy and addresses major concerns shared by citizens in Europe and elsewhere. A challenge-based approach will bring together resources and

knowledge across different fields, technologies and disciplines, including social sciences and the humanities. This will cover activities from research to market with a new focus on innovation-related activities, such as piloting, demonstration, test-beds, and support for public procurement and market uptake. It will include establishing links with the activities of the European Innovation Partnerships. Funding will be focused on the following challenges:

- *Health, demographic change and wellbeing*;
- *Food security, sustainable agriculture, marine and maritime research and the bio-economy*;
- *Secure, clean and efficient energy*;
- *Smart, green and integrated transport*;
- *Climate action, resource efficiency and raw materials*;
- *Inclusive, innovative and secure societies*.

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Biology perspective

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Physics perspective

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Modern radiation oncology is a well-established, cost-effective and essential component in the curative and palliative treatment of malignancy. Indeed, these are exciting times for physicists and engineers in Radiotherapy. The challenge of individualized treatment optimization continuously drives research and technology, yet we should be careful not to get trapped in the "Cargo Cult Science" as described by Richard Feynman. In fact that same physicist once compared physics to sex by saying: "Sure, it may give some practical results, but that's not why we do it." In an attempt of avoiding a blind gallop towards increasingly more precise means of tumour localization and delivery this physics perspective on research challenges will contemplate 3 topics: (a) Due to this cutting edge technology, one might argue that radiation oncology, long considered to be a physical intervention, is now more accurately conceptualized as a biologic intervention with profound effects at the cellular and molecular level. The big challenge is to bring these concepts into daily clinical routine. To quote yet another physicist, Paul Davis: "It's like trying to run the economy of the US by measuring every transaction in every community and city." (b) As systems become more automated and complex the potentials for failure become less intuitively obvious and we need more process-oriented rather than device oriented Quality Assurance to ensure patient safety. Quoting an ESTRO honorary physicist, Pierre Scalliet: "Complex technologies should therefore be managed with great foresight, particularly focusing on preventive management." It suffices no longer to prove we can irradiate phantoms with high precision, patients demand proof of the true delivered dose in their particular case. (c) Scientific and technological progress comes at a significant cost, and many concerns exist regarding the value of that progress. Within these difficult economic times, healthcare politicians face the difficult challenge to create a fertile soil (e.g. supporting adequate reimbursement) allowing progress through efficacy and driven by outcomes. There is also a danger in that too much focus on sophisticated expensive technology may create a double layer health care system where not all patients have access to the best of care. Ideally, efforts in development should also aim at harmonizing the quality of care throughout Europe and the rest of the world.

Technological developments in radiation oncology pave the way for tailored individualised therapy within the context of more sophisticated and complex treatments. However, the true individualised treatment using precise and biological conformal dose delivery, requires more than progress in one discipline only and the real progress awaits in the synergistic combination of the different disciplines allowing upfront identification of the most effective treatment for the individual patient and the possible adaptation based on response during treatment. This strategy can only work when the different treatment platforms evolve simultaneously and allow for optimal cross-fertilization. As always, with each step forward we realize there is an increased number of things we know too little about, or to quote Winston Churchill: "Every day you may make progress. Every step may be fruitful. Yet there will stretch out before you an ever-lengthening, ever-ascending, ever-improving path. You know you will never get to the end of the journey. But this, so far from discouraging, only adds to the joy and glory of the climb."